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(56) Documents Cited
GB 2343536 A JP 2000236371 A
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(54) Abstract Title
Mobile device vibrating in response to a predetermined condition

(57) A mobile device such as a mobile phone has a vibrating device coupled to a processor and operable to vibrate in response to a predetermined condition such as an incoming call. The vibrations are transmitted to the external case which is profiled on the underside such that when the mobile device is placed on a surface such as a desk and the vibrating device is operated, the vibrations cause the mobile device to move on the surface, the movement being controlled by the processor such that the mobile device describes a predetermined locus on the surface. The mobile device may also be a hand-held game, toy or other portable electronic device. The vibrating device is a miniature multi-pole core-less micro-motor with an off axis mass.

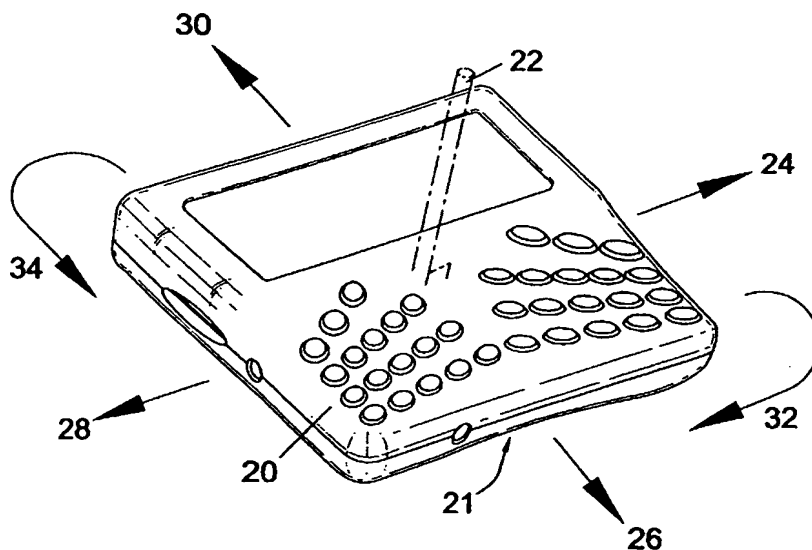


Fig. 2

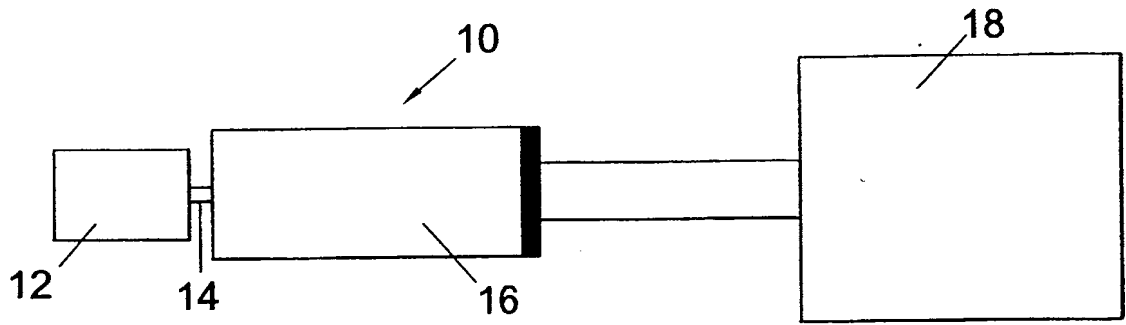


Fig. 1

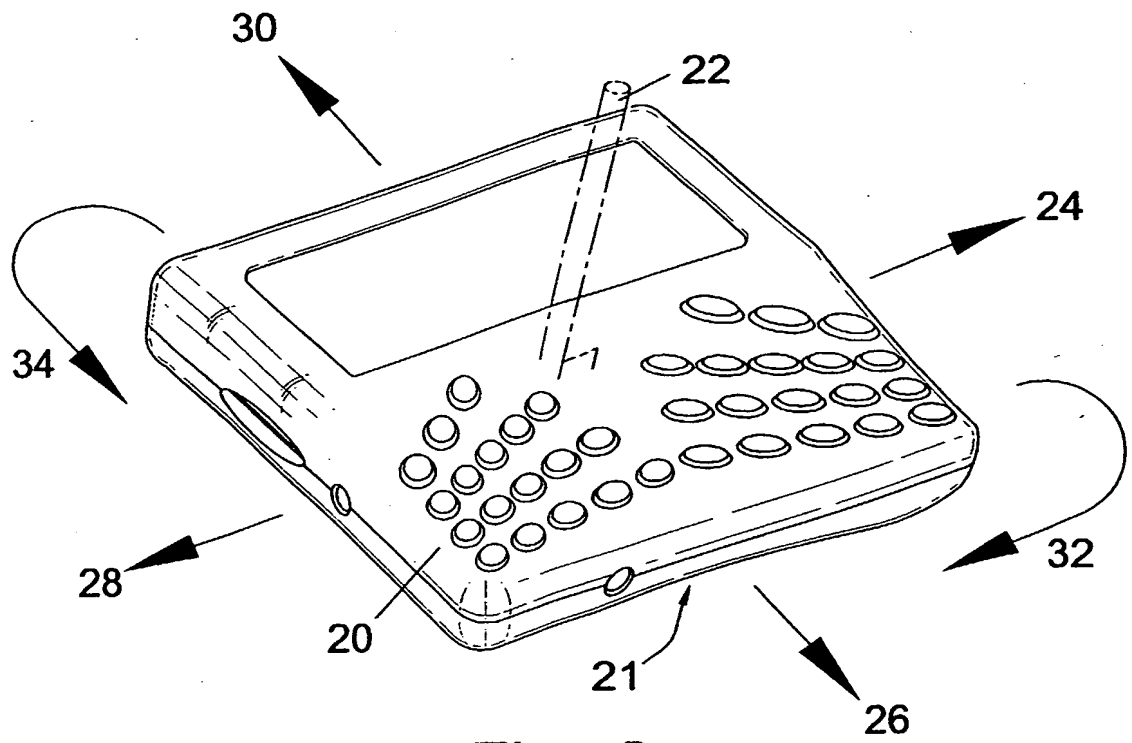


Fig. 2

A MOBILE DEVICE

This invention relates to a mobile device. It is particularly applicable, but by no means limited, to hand-held mobile devices such as mobile phones or personal digital assistants.

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In many hand-held mobile devices, such as mobile telephones or personal digital assistants (PDAs), an audible or vibrating alert is used in order to make the user aware of a certain condition or state such as incoming data or telephone calls, messages, alerts, alarms, battery condition etc. Such alerts, whilst attracting the user's attention by way of the senses of hearing and/or touch, do not appeal to or catch the eye.

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It is an object of the present invention to overcome the shortcomings of prior mobile devices by providing a means by which a mobile phone may alert the user by visual means.

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According to the present invention there is provided a mobile device comprising an external case, a vibrating device and a processor; the vibrating device being electrically coupled to the processor and operable to vibrate under control of the processor in response to a predetermined condition; the vibrating device being mounted on or within the mobile device such that operation of the vibrating device transmits vibrations to the external case; and the underside of the external case being profiled such that, when the mobile device is placed on a surface such as a desk and the vibrating device is operated by the processor, the said vibrations cause the mobile device to move on the said surface, the movement of the mobile device being controlled by the processor such that the mobile device describes a predetermined locus on the said surface. This advantageously provides the user with a visual alert which may be used to complement an audible alert. By moving the device

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around on the surface (e.g. on a desk or table) the user is alerted to the presence of an incoming communication in a distinctive and eye-catching manner. The mobile device may also be configured such that its movement complements its outward appearance (e.g. a snake-skin patterned device could move in a manner similar to that of a snake). A further
5 advantage is that a company's corporate logo or another symbol may be described by the movement of the device, thereby enabling it to advertise a company or to promote a brand through its movement.

Preferably the vibrating device is further operable to vibrate at a plurality of selectable
10 frequencies as selected by the processor. This advantageously enables the device to move at different speeds on the said surface.

Preferably the vibrating device is an eccentric motor. Such a motor may be operated in a forward direction or a backward direction, thereby enabling the direction of vibrational motion
15 of the mobile device to be changed.

Preferably the eccentric motor is a multi-pole core-less micro motor with an off-axis mass distribution.

20 Particularly preferably the mobile device comprises at least two vibrating devices, the vibrating devices being independently operable by the processor to give movement of the mobile device in any direction on the said surface. This advantageously enables the mobile device to describe complex loci on the said surface.

According to the present invention there is also provided a method of alerting a user of a mobile device to a condition such as an incoming communication, the method being performed by a processor in the mobile device when the mobile device has been placed on a surface such as a desk, and comprising independently operating one or more vibrating
5 devices in the mobile device such as to transmit vibrations to the case of the mobile device in order to cause the mobile device to move on the said surface and describe a predetermined locus.

Embodiments of the invention will now be described, by way of example, and with reference
10 to the drawings in which:

Figure 1 illustrates internal components of a mobile device such as a mobile phone; and
Figure 2 illustrates a mobile device in use on a surface such as a desk.

As illustrated in Figure 1, a hand-held mobile device such as a mobile phone comprises a
15 processor 18 electrically coupled to a vibrating device 10. The application of the invention is by no means limited to mobile phones, though, and may alternatively be realised in, *inter alia*, personal digital assistants, hand-held games and toys, laptop computers, and other hand-held portable electronic devices. Larger, non-hand-held mobile devices are also by no means excluded from the application of the invention.

20 The vibrating device 10 is a miniature multi-pole core-less micro motor with an off-axis mass, and is activated on command from the processor 18. The vibrating device 10 comprises an off-axis mass 12 that is rotatably driven by the drive motor 16 via a drive shaft 14. The drive motor 16 is typically of the flat 'pancake' variety, such as manufactured by Panasonic, and is
25 secured inside the main chassis or body of the mobile device as far as possible from its

centre of gravity in order to maximise the vibrating effect. The vibrating device could either be set in a polymer mount and electrically connected to a circuit board within the mobile device, or alternatively could be soldered directly to a circuit board. In the latter case the solder would serve as both the electrical and mechanical connection to the board. In the
5 former case the polymer mount must not be unduly rigid, since vibration of a rigidly-mounted vibrating device might damage dry soldered joints in the printed circuit board which could then result in premature failure of the circuitry.

As the motor 16 is driven, rotation of the off-axis mass generates vibrations, and these
10 vibrations are transmitted to the case of the mobile device.

In a preferred embodiment of the invention the speed of rotation of the motor 16, and hence the frequency of the vibrations, is variable, being controlled by the processor 18.

15 The vibrating device 10 which is essentially an eccentric motor, is mounted inside the mobile device. As shown in Figure 2, the eccentric motor is mounted such that the axis of revolution 22 of the off-axis mass 12 is perpendicular to the bottom surface 21 of the mobile device 20 that would ordinarily lie on a surface such as a desk.

20 The underside 21 of the mobile device 20 is profiled such that vibrations caused by the vibrating device 10 cause the mobile device 20 to move in one or more of a plurality of possible directions. Both translational and rotational movement of the mobile device 20 is possible.

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More than one vibrating device may be employed to enable movement of the mobile device in a combination of directions: by locating one vibrating device 10 at the centre of mass of the mobile device 20, its vibration will cause the mobile device to rotate 32, 34. Reversal of the direction of rotation may be achieved by reversing the direction of operation of the motor 16. Additionally, by positioning vibrating devices away from the centre of gravity of the mobile device, motion in forward 30 or backward 26 directions may also be realised, together with movement to the left 28 and right 24.

The directional control of the mobile device 20 may be considered as being broadly analogous to that of a military tank having two caterpillar tracks. With a mobile device 20 having two vibrating devices 10, operation of one or the other of the vibrating devices will cause the mobile device 20 to rotate 32, 34, whereas operation of both devices simultaneously will give rise to translational movement, either in a straight line or in a more snake-like path.

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The processor 18 may be pre-programmed with a selection of different loci through which the mobile device 20 may move, and the user may make a choice from this selection. Alternatively, customised loci may be programmed by the user. The mobile device 20 may be configured to move in a certain fashion to suit its styling (e.g. a snake-skin patterned device may be made to move in a fashion similar to that of a snake). Company logos or corporate symbols may also be described in a similar manner.

CLAIMS

1. A mobile device comprising an external case, a vibrating device and a processor;

the vibrating device being electrically coupled to the processor and operable to vibrate under control of the processor in response to a predetermined condition;

5 the vibrating device being mounted on or within the mobile device such that operation of the vibrating device transmits vibrations to the external case;

and the underside of the external case being profiled such that, when the mobile device is placed on a surface such as a desk and the vibrating device is operated by the processor, the said vibrations cause the mobile device to move on the said surface, the movement of the mobile device being controlled by the processor such that the mobile device describes a predetermined locus on the said surface.

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2. A mobile device as claimed in Claim 2 wherein the vibrating device is further operable to vibrate at a plurality of selectable frequencies as selected by the processor.
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3. A mobile device as claimed in Claim 1 or Claim 2 wherein the vibrating device is an eccentric motor.

- 20 4. A mobile device as claimed in Claim 3 wherein the eccentric motor is a multi-pole core-less micro motor with an off-axis mass distribution.

5. A mobile device as claimed in any preceding Claim comprising at least two vibrating devices, the vibrating devices being independently operable by the processor to give movement of the mobile device in any direction on the said surface.
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6. A method of alerting a user of a mobile device to a condition such as an incoming communication, the method being performed by a processor in the mobile device when the mobile device has been placed on a surface such as a desk, and comprising independently operating one or more vibrating devices in the mobile device such as to transmit vibrations to the case of the mobile device in order to cause the mobile device to move on the said surface and describe a predetermined locus.
7. A mobile device substantially as hereinbefore described with reference to the accompanying drawings.
8. A method substantially as hereinbefore described with reference to the accompanying drawings.



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Claims searched: All

Examiner: Gareth Griffiths
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Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.T): G4F (FAB), H4L (LERA, LERX, LESF, LEUX)
Int Cl (Ed.7): G08B 5/22, 5/30, 5/32, 6/00, H04B 1/38, H04Q 7/14, 7/32, 7/38
Other: Online Databases: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB2343536 A (NOKIA) whole document	1 & 6 at least
X	JP2000059837 A (CASIO) EPODOC/PAJ abstracts and figures 1, 2, 7 & 8	1 & 6 at least
X	JP2000236371 A (TAITO) EPODOC/PAJ abstracts and figures 1-7	6 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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